City University
School of Engineering and Mathematical Sciences
Common Part 1

ME1107 Computing

Coursework 3B – Fortran

Q1-Q4:

- Submission: hardcopy (printed on A4 papers with a coversheet) to Dr Yan and softcopy (Word document CW3B_your_name.doc and all FORTRAN source files .f95) to CitySpace.
- Due date: 8/12/2008

Q5: in-class marking in week 11 commencing 8/12/08. No late submission will be accepted.

Q1 (30 marks) Draw flowcharts for the following programs or program segments and answer the questions in the Word document. Flowchart can be hand drawing. Although you should use correct flowchart symbols, no marks will be deducted for wrong symbols.

1.1 What is program output?

```
      Program prog11
      IMPLICIT NONE
      Integer i
      do 30 i = 10,2,-2
      write(*,*) i
30    continue
      stop
      end program prog11
```

1.2 What is program output?

```
PROGRAM NESTED
! Illustration of nested DO-loops
IMPLICIT NONE
INTEGER I, J                  ! loop counters
DO I = 1, 6                   ! start of outer loop
PRINT *, 'Outer loop with I = ', I
DO J = 1, 3                   ! start of inner loop
PRINT *, ' I, J = ', I, J
END DO
PRINT *                       ! a blank line
END DO                        ! end of repeated section
END PROGRAM NESTED
```

1.3 What is program output?

```
PROGRAM XLOOP
! Illustration of non-integer values
IMPLICIT NONE
INTEGER I                     ! loop counter
REAL DX                       ! increment
REAL X0                       ! non-integral initial value
REAL X                        ! value to be output
X0 = 0.5                      ! set initial value
DX = 0.3                      ! set increment
DO I = 1, 10                  ! start of repeated section
```

```
      X = X0 + (I - 1) * DX          ! actual value to be output
      PRINT *, X
      END DO                         ! end of repeated section
      END PROGRAM XLOOP
```

1.4 What will be the output if input a = 0, 1 or -1?

```
read(*,*) a
if (a < 0)  a = -a
write(*,*) a
```

1.5 The following program segment is for trapping unwanted input to variable a. What is the program output for a = -100, 0 or 100?

```
100   write(*,*) ' please enter a non-negative number'
      read(*,*) a
      if (a <=0) goto 100
      write(*,*) a
```

1.6 What will be the output if a = 10, b = 100 or a = 100, b = 10?

```
Read(*,*) a, b
if (a > b) then
      temp = a
      a = b
      b = temp
end if
write(*,*) 'numbers are in ascending order'
write(*,*) a, b
```

1.7 The following program converts a mark into a grade. Write the program output for mark = 85, 73, 101, 60, 33, 55.

```
Read(*,*) mark
if (mark <= 100.and.mark >= 80) then
      Write(*,*) 'mark = ', mark, ' Grade A'
else if (mark < 80.and. mark >= 60) then
      Write(*,*)'mark = ', mark, ' Grade B'
else if (mark < 60.and.mark >= 40) then
      Write(*,*)'mark = ', mark, ' Grade C'
else if (mark < 40.and.mark >= 0) then
      Write(*,*)'mark = ', mark, ' Fail'
else
      Write(*,*) ' incorrect mark'
end if
```

Q2 – Q4:
Write programs in Plato IDE. Copy the program to the Word document as part of the answer. Show the program output (the black DOS window) in the Word document (use Prt Scr key to copy the screen as an image and paste it in the Word document). All source files (.f95) should be submitted to CitySpace. Remember:

- Your name, group, date are included in the comment lines
- IMPLICIT NONE is used in the program
- Display your name and group in the program output window (the black DOS window)

Q2 (10 marks)
Write a program (CW3B1_yourname.f95) that displays a number sequence between x_1 and x_2 with a fixed increment dx.

$$dx = (x_2-x_1)/N$$

x_1, x_2 and N are entered via keyboard at the run time of the program. If $x_1 \geq x_2$, the program should ask the user to re-enter numbers for x_1 and x_2.

Test the program with N = 5, x_1 = 1, x_2 = 0; then x_1 = 0, x_2 = 1.

Q3 (20 marks)
Write a program (CW3B2_yourname.f95) which reads N real numbers from keyboard and calculate the mean value of those N numbers. N is given at the run-time of the program.

Use the 4 numbers corresponding to the first 4 letters of your surname (same as in CW2) as the input to test the program.

Q4 (20 marks)
Write a program (CW3B3_yourname.f95) to calculate and display the values of function f(x) for x between -1 and 1. The number of steps for x is entered via keyboard at the run-time of the program.

$$f(x) = \begin{cases} -x & if\ x \leq 0 \\ x^2 & if\ x > 0 \end{cases}$$

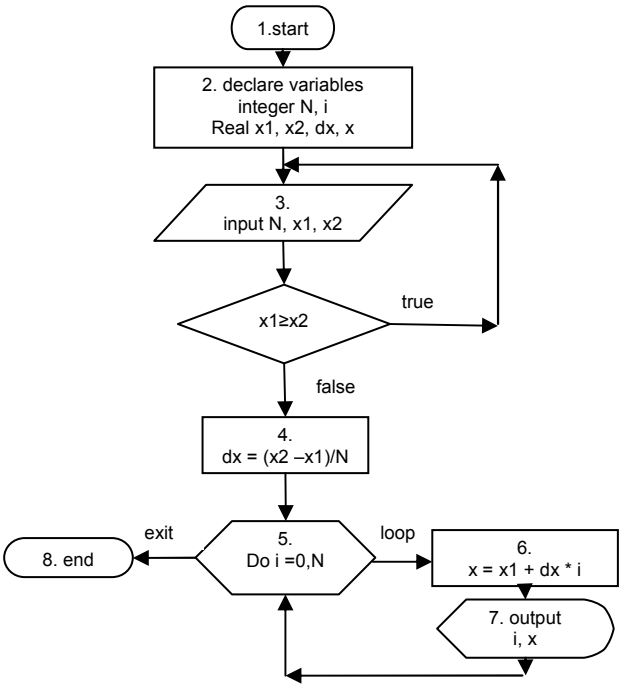
Test the program with N = 10.

Q5 (20 marks)
20 marks will be given to the in-class marking question. You will be asked to write a program on a piece of paper. You are allowed to use the computer to test your program. In-class marking will be done during your tutorial class in week 11 commencing 8/12/08. No late submission will be accepted for this question.

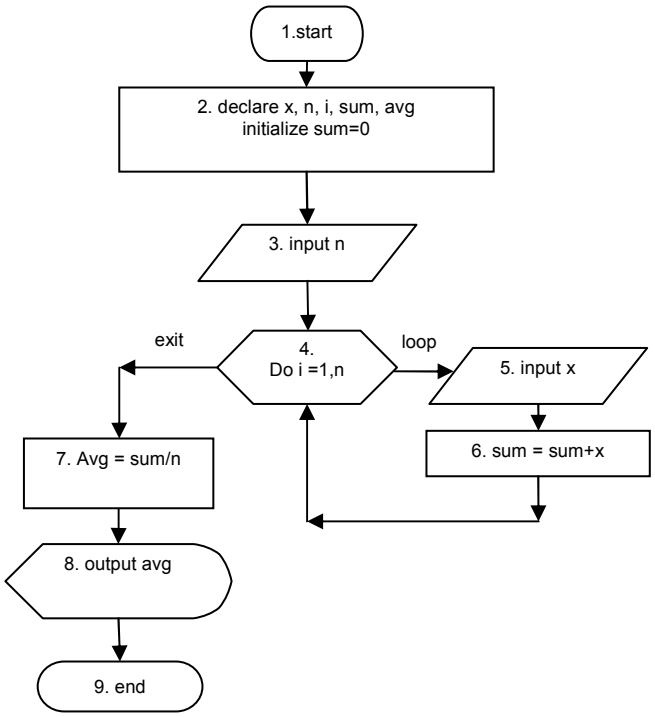
Flowchart

Flowcharts are given to help you write programs. You don't have to follow the flowcharts, they are for reference only.

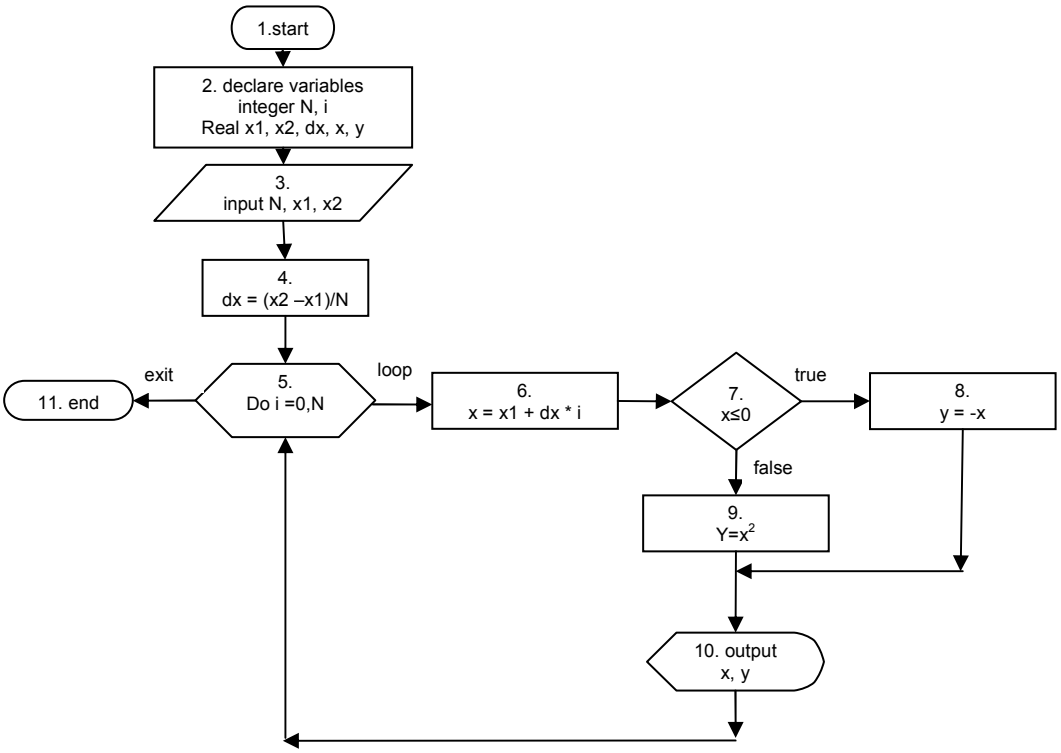
Q2



Q3



Q4.


1.start
2. declare variables
integer N, i
Real x1, x2, dx, x, y
3.
input N, x1, x2
4.
dx = (x2 –x1)/N
5.
Do i =0,N
exit
11. end
loop
6.
x = x1 + dx * i
7.
x≤0
true
8.
y = -x
false
9.
Y=x2
10. output
x, y